MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2018/2019

BDS4614 – MANAGEMENT DECISION SCIENCE
(All sections / Groups)

28 MAY 2019
9.00a.m.-12.00p.m.

(3 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **5** printed pages excluding the cover page, with **5** questions only.

2. Attempt **ALL** the questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Students are allowed to use non-programmable scientific calculators (without restriction).

4. All necessary workings must be shown and please write all your answers in the answer booklet provided.

QUESTION 1

Eco Sports manufactures three models of yoga mats used for yoga exercises, Luxury I, Luxury II and standard. Manufacturing each Luxury I yoga mat requires 24lb of rubber, 16lb of PVC, and 18 minutes of labour. Manufacturing each Luxury II yoga mat requires 16lb of rubber, 18lb of PVC, and 20 minutes of labour. Manufacturing each Standard yoga mat requires 18lb of rubber, 14lb of PVC, and 18 minutes of labour. The profits of Luxury I yoga mat and Luxury II yoga mat are RM22/unit and RM20/unit respectively, while the profit of each Standard yoga mat is RM10. If 24,000lb of rubber, 24,000lb of PVC and 400 labour hours are available for the production of yoga mat, what is the maximum profit could be obtained?

a. Formulate the given problem as a Linear Programming Problem.

(4 marks)

b. Set up the initial simplex tableau by including the necessary slack variables.

(4 marks)

c. Determine the second simplex tableau by using simplex method.

(4 marks)

Given the following final table

C_j		22	20	10	0	0	0	
	Solution Mix	X1	X2	X3	S1	S2	S3	Quantity
22	X1	1	0	3/8	5/48	0	-1/12	500
0	S2	0	0	-17/8	1/48	1	-11/12	2500
20	X2	0	1	9/16	-3/32	0	1/8	750
	Z_j	22	20	39/2	5/12	0	2/3	26000
	$C_j - Z_j$	0	0	-19/2	-5/12	0	-2/3	

S1 – slack for constraint I
S2 – slack for constraint II
S3 – slack for constraint III

d. What is the optimal solution and the maximum value?

(4 marks)

e. What are the shadow prices of the three constraints and explain what do they mean?

(4 marks)

(Total: 20 marks)

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QUESTION 2

a. Kings Sport received order for three similar products, I, II, and III. Three machines are available for the production of the three products. However, due to the setting of the machines, the unit cost of the products vary depending on the machine used. Machine capacities, demand for the next month and the unit costs (in RM) are as follows:

Machine	Product			Capacity(units)
	I	II	III	
A	2	1.8	3.6	1500
B	3.2	2.2	2.0	3000
C	2.3	2.6	2.4	1500
Demand(units)	2000	2000	2000	

Determine the optimal production plan that minimizes the total production costs.

(10 marks)

b. King Sport divided the order into four parts, A, B, C, and D. Each part will need a supervisor to supervise the production process. The expected time to complete the production of each part by each supervisor are shown in the following table:

Parts	Supervisor			
	Karen	Lim	Nurul	Carmen
A	15	13	12	12
B	10	10	7	9
C	14	12	8	11
D	18	16	14	16

Find the job assignment that would minimize the expected completion time. What is the minimum expected completion time?

(10 marks)
(Total: 20 marks)

QUESTION 3

An event organiser is preparing the rundown of the biggest company's event in 2019. The activities and the related information are listed in the following table.

Activity	Hours			Immediate Predecessors
	a	m	b	
A	3	4	5	-
B	3	4	5	A
C	5	6	7	A
D	7	8	9	B
E	2	5	8	C, D
F	5	6	7	E
G	3	4	5	F
H	5	6	7	E,F
I	2	3	4	G, H
J	6	7	8	I

a. Construct a network diagram for this problem.

(6 marks)

b. Determine the expected time, ES, EF, LS, LF and slack for each activity.

(10 marks)

c. Determine the critical path and the expected completion time.

(4 marks)

(Total: 20 marks)

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QUESTION 4

Ecohome manufactures and sales furniture. At the present time, the general manager of Ecohome is forced to consider purchasing new machines because of the increased in demand. The alternatives are shown in the following table

Alternative	Market Condition		
	Good	Fair	Poor
MI	150,000	120,000	-30,000
MII	170,000	130,000	-40,000
MIII	200,000	135,000	-60,000
Probabilities	0.35	0.45	0.2

a.   Determine the best alternative, using the following decision criteria:

i. Maximax

(2 marks)

ii. Maximin

(2 marks)

iii. Hurwicz criterion of realism ($\alpha = 0.3$)

(4 marks)

b.   The general manager of Ecohome has been approached by a market research firm that offers to perform a market study at a fee of RM10, 000. The research firm claims that the researchers are able to make the following statements of probability based on their experience:

> Probability of a Good market given favourable study = 0.50
>
> Probability of a Fair market given favourable study = 0.35
>
> Probability of a Good market given unfavourable study = 0.20
>
> Probability of a Fair market given unfavourable study = 0.35
>
> Probability of a favourable study = 0.65

Construct a tree diagram for the problem and use the EMV approach to recommend a strategy.

(12 marks)
(Total: 20 marks)

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QUESTION 5

Techcomp has an annual demand of 3200 units for Model A computer. The cost of the computer is RM3000. The carrying cost is estimated to be 2% of the unit cost, and the ordering cost is RM250 per order.

a. Determine the optimal order quantity.

(4 marks)

b. Determine the annual inventory cost.

(2 marks)

c. Determine the total annual cost.

(4 marks)

d. If Techcomp orders in quantities of 250 or more, it can get a 5% discount on the cost of the computer. Should Techcomp take the quantity discount? Assume the demand is constant.

(10 marks)
(Total: 20 marks)

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